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ORD-077-83

25 January 1983

MEMORANDUM FOR : Deputy Director of Science & Technology

FROM : [redacted] 25X1
 Chief, Processing and Analysis
 Technology Group
 Office of Research and Development

SUBJECT : CRAY Super Computers [redacted] 25X1

1. Action_Required - None, information is provided in anticipation of a briefing by CRAY. Information includes a brief description of the CRAY and other super computers, a reminder of DDI and ODP interest in CRAY's, and, a description of ORD research with CRAY's. [redacted] 25X1

2. The_Super_Computer - Most computers today process information serially -- they perform one operation at a time on one piece of data at a time. This is appropriate for a large class of computing problems generally described as "business applications" which have relatively large amounts of input and output (text, for example) and relatively modest amounts of computation per datum. Some scientific problems, however, are more computationally intensive. Moreover, they can be described algorithmically in terms of parallel processing -- e.g., matrix arithmetic. The epitome of computers designed for such jobs is the CRAY, designed by Seymour Cray. Super-cooled and super-expensive, the CRAY provides a very fast array processing capability -- one so fast and powerful that it commonly is fed by several very large computers which manage the file storage and housekeeping. Perhaps fifty such computers have been sold. They are in use by oil companies, NSA, and Los Alamos, among others. [redacted] 25X1

3. Agency_Interest_in_Super_Computers -- At various times, the Central Intelligence Agency has discussed acquiring such a capability. [redacted] at an EXCOM meeting several years ago, exclaimed its virtues in terms of the faster turnaround that OD&E engineers could get on their [redacted] 25X1

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modelling computations; alternatively, a more complete exploration of any "option-space" could be thus undertaken. The DDI has also proclaimed the virtues of a CRAY and ODP tried to determine the Agency's needs. Apriori, ODP raised two issues above and beyond the cost: (i) what additional skills would they have to acquire for such an unfamiliar beast? and, (ii) what software modifications are required to have computer programs utilize the CRAY potential? There have been several panels and working groups within the Agency that have been examining the problems dealing with the Agency's computational requirements for the future. A recommendation from one of the panels has been that a scientific computing environment (e.g., CRAY, IBM 3838, etc.) will be required to satisfy the Agency's needs within this decade. [redacted]

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4. ORD_Research - The Office of Research and Development has recently initiated a project [redacted] to examine the computational efficiencies of super computers (e.g., CRAYs) and to identify the problems in converting software to run on these computers. ORD has had extensive experience in developing and/or converting large software packages to run on the Agency's computer system. Sometimes, the packages have placed enormous computational burdens on the Agency's system. [redacted]

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5. The ORD project will compare the CRAY [redacted] with the IBM 3081 [redacted]. This benchmarking study will be performed with several software systems with which ORD has had experience in applying it to actual intelligence applications. In most of the cases, the software packages have not been developed or optimized to obtain a maximum performance from either type of hardware configuration, i.e., parallel processing for CRAY or serial processing for the IBM. [redacted]

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6. The following types of model formulations and their related intelligence application will be used in this benchmark study:

simulation models	- space decision analysis
	- reservoir analysis
	- hydrologic analysis
linear programming	- refinery analysis
network models	- transportation analysis
computer graphics	- orbital graphics; maps
econometric models	- Soviet and Common Market models.

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7. An ORD research report will be prepared at the completion of the project. It is anticipated that the report will be completed in the last quarter of 1983. The report will summarize the performance evaluation tests and analyze some of the potential benefits and problems.

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